

**ABSTRACT**

Methods and systems in a wireless receiver for enabling the reception of input signals at varied power levels in the presence of co-channel interference utilizing combinations of space-time adaptive processing (STAP), interference cancellation multi-user detection (MUD), and combined STAP/MUD techniques. In MUD, code, timing, and possibly channel information of multiple users are jointly used to better detect each individual user. The novel combination of adaptive signal reconstruction techniques with interference cancellation MUD techniques provides accurate temporal cancellation of interference with minimal interference residuals. Additional methods and systems extend adaptive signal reconstruction techniques to take Doppler spread into account. STAP techniques permit a wireless receiver to exploit multiple antenna elements to form beams in the direction of the desired signal and nulls in the direction of the interfering signals. The combined STAP-MUD methods and systems increase the probability of successful user detection by taking advantage of the benefits of each reception method. An additional method and system utilizes STAP techniques in the case where no pilot signal is available. This method compares the outputs of various hypothesized STAP solutions.